The Newcastle GNAAC Annual Report for 2001

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The GNAAC at University of Newcastle continued activities with submissions of weekly G-network and P-network SINEX files. The analysis procedure outlined previously (Davis & Blewitt, 2000; Nurutdinov et al., 2000) remained unchanged throughout the year 2001. Starting with GPS week 1065 the IGS97 realization of ITRF97 has been used to constrain the solution. Starting with GPS week 1143 it has been replaced with IGS00 realization of ITRF2000.

G-network Results

A-network SINEX data from all seven global analysis centres (COD, EMR, ESA, GFZ, JPL, NGS, SIO) were processed in the year 2001. The appearance of a station in a minimum of three solutions defines a global station for inclusion in the combined NCL G-network (Figure 1). Any remaining stations and RNAAC (AUS, EUR, GSI, SIR) stations (Figure 2) are defined as regional stations and are included in the P-network along with global stations. During 2001 an average of 103 global and 75 regional stations appeared in the weekly P-network; this contrasts with 100 and 60 respectively during 2000.

The loose G-network solution (GNET) is estimated from block of normal equations composed of each de-constrained A-network. The corresponding covariance matrix is augmented to remove Helmert rotation parameter constraints. This solution is constrained later to the CORE 51 stations of IGS97 or CORE 54 stations of IGS00, for the months Jan-Nov or December of the year 2001 respectively, producing the constrained G-network.

Figure 3 shows the weighted RMS of residuals for each weekly A-network solution after Helmert transformation to the weekly loose G-network solution for all weeks of the year. Values for weighted RMS are in the region 0.4-1.9 mm describing repeatability of the G-network estimates.

Figures 4 through 7 show the translation (for X, Y, Z coordinates) parameters for 7-parameter Helmert transformation from deconstrained AC and GNET solutions to IGS97 and IGS00 used for the Jan-Nov and December 2001 respectively.

The effect of introducing of IGS00 realisation of ITRF2000 in December 2001 instead of IGS-97 realisation of ITRF-97 used before is seen clearly from the table below. Mean values of the scale parameter of the Helmert transformation from AC solutions to the IGS CORE network become 1.5-4.5 times smaller.

Analysis Center	COD	EMR	ESA	GFZ	JPL	NGS	SIO	GNET
Mean*10^9; Jan-Nov	**2.345**	**2.069**	**2.258**	**2.444**	**2.351**	**2.589**	**2.314**	**2.209**
Std.Dev. *10^9; Jan-Nov	0.325	0.404	0.450	0.405	0.282	0.641	0.245	0.161
Mean*10^9; December	**1.622**	**0.762**	**1.176**	**1.346**	**0.512**	**1.228**	**1.448**	**1.155**
Std.Dev.*10^9;December	0.024	0.273	0.575	0.140	0.060	0.116	0.146	0.095

P-network Results

The creation of the P-network is based on the G-network and the weekly input R-SINEXes from the RNAACs. A minimum of three global and one regional stations is required for inclusion of a solution in the P-network. However this criterion was not met sometimes.

From the RNAACs the solutions from AUS, EUR, SIR, GSI were included 53, 53, 53 and 37 times respectively during 2000, contrasting with 51, 53, 45 and 3 times during 1999.

In the "attachment" method of network combination the G-network is not allowed to be perturbed by the R-networks. Figure 8 shows time series of the RMS residuals of station coordinates after 7-parameter Helmert transformation of the deconstrained R-network to the G-network.

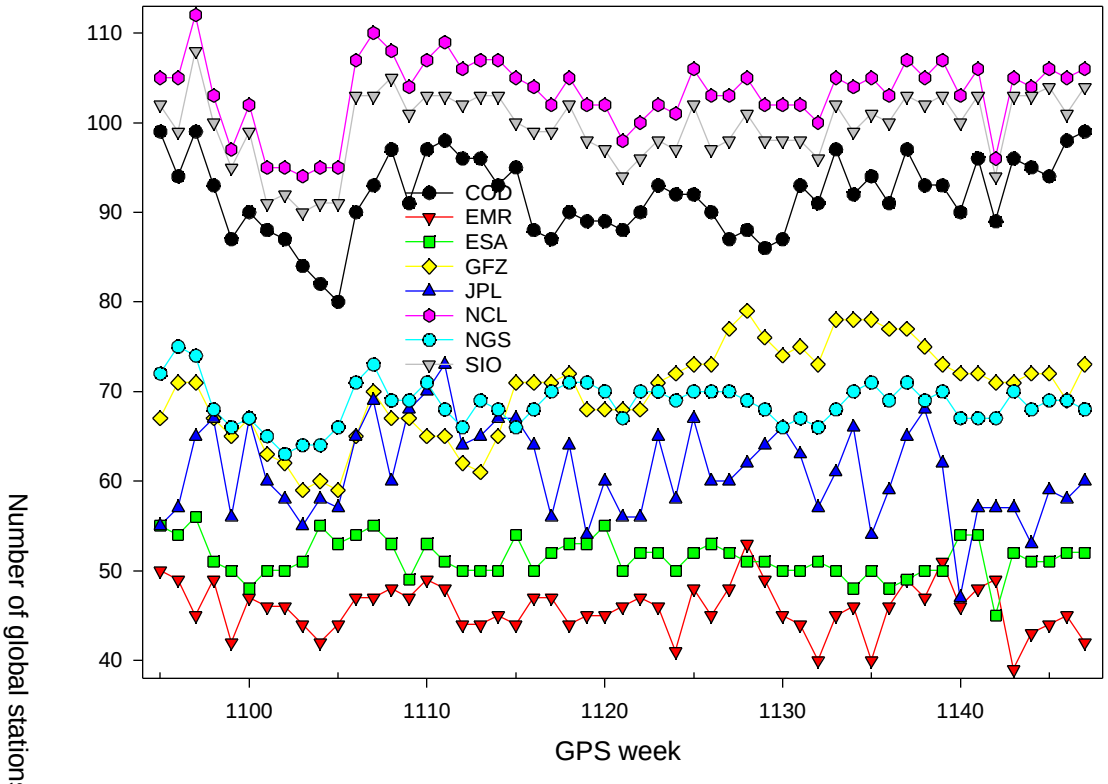

Figure 1. Number of global stations in AC data

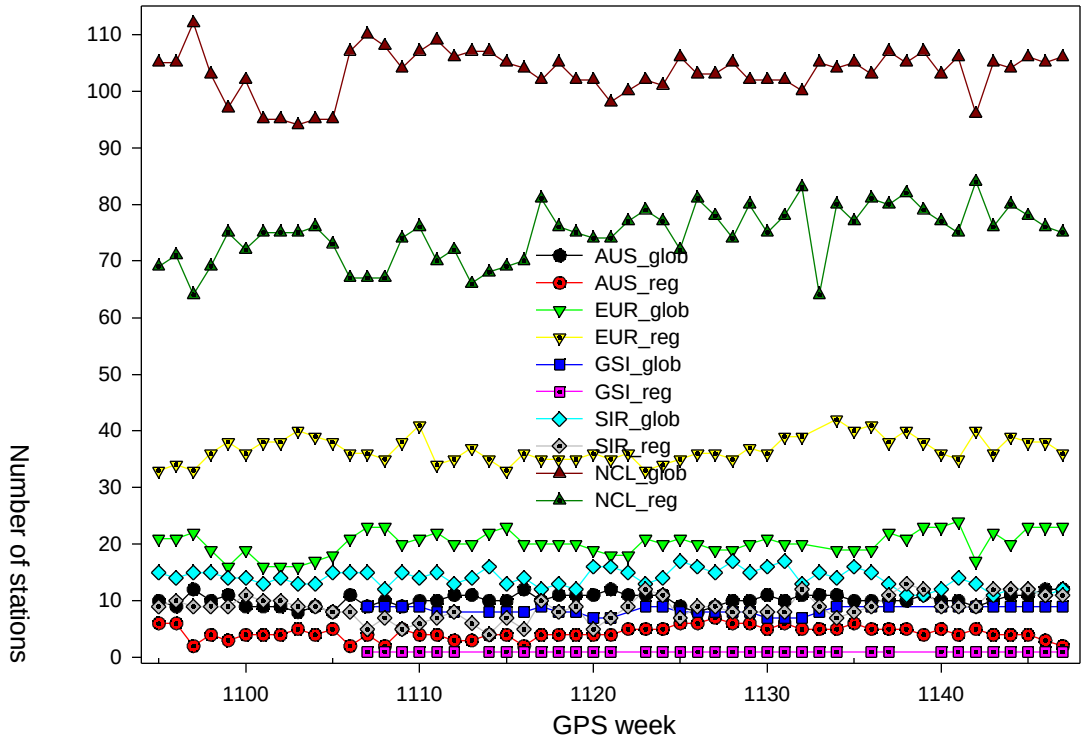

Figure 2. Number of global and regional stations in RNAAC and P-network solutions

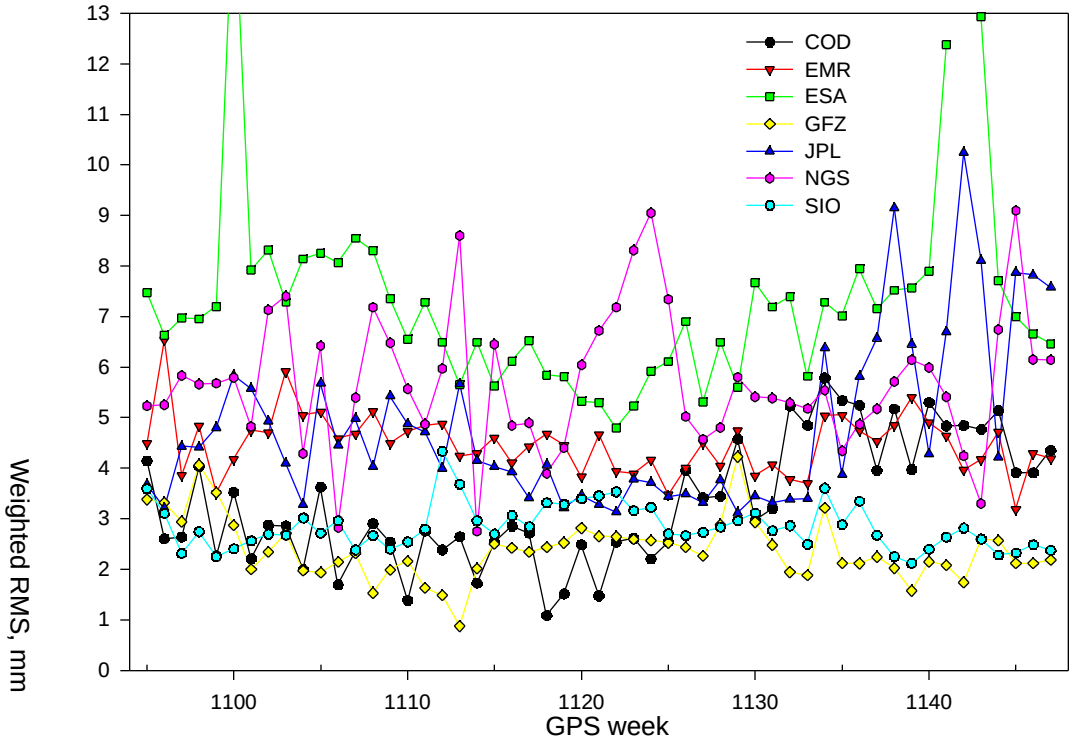

Figure 3. Weighted RMS of residuals for AC network transformation to loose NCL G-network

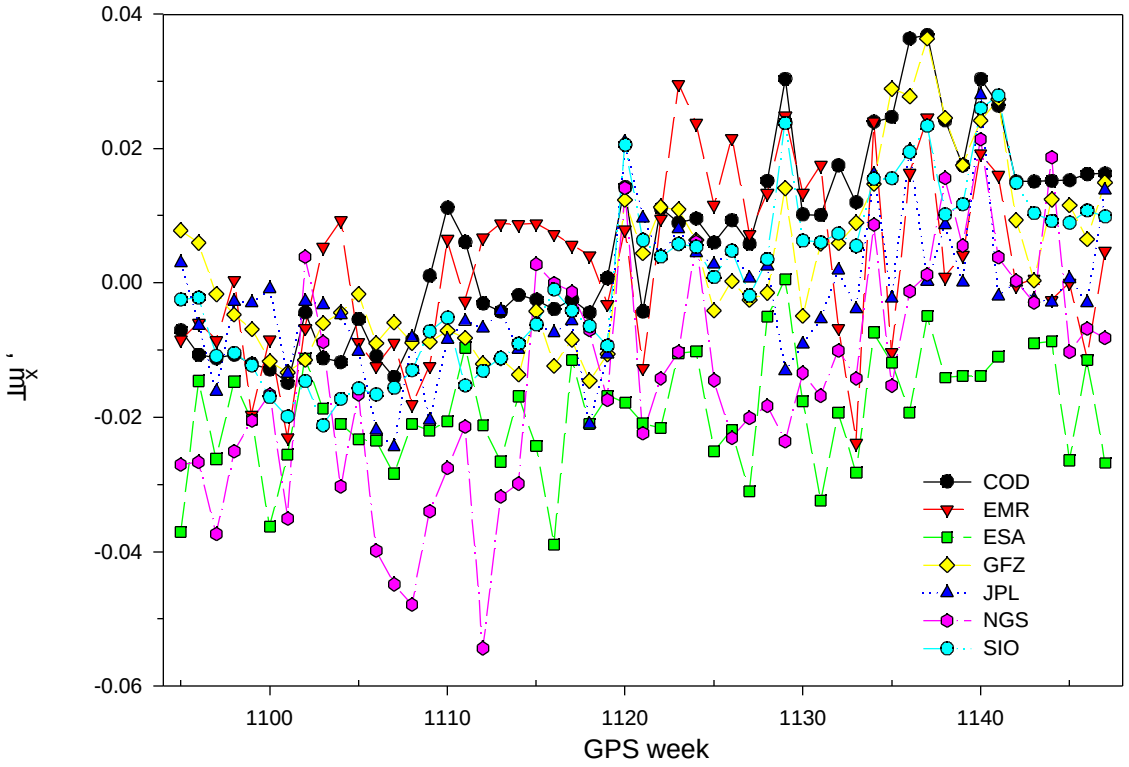

Figure 4. Time series of T_x transformation parameter for the ACs to IGS

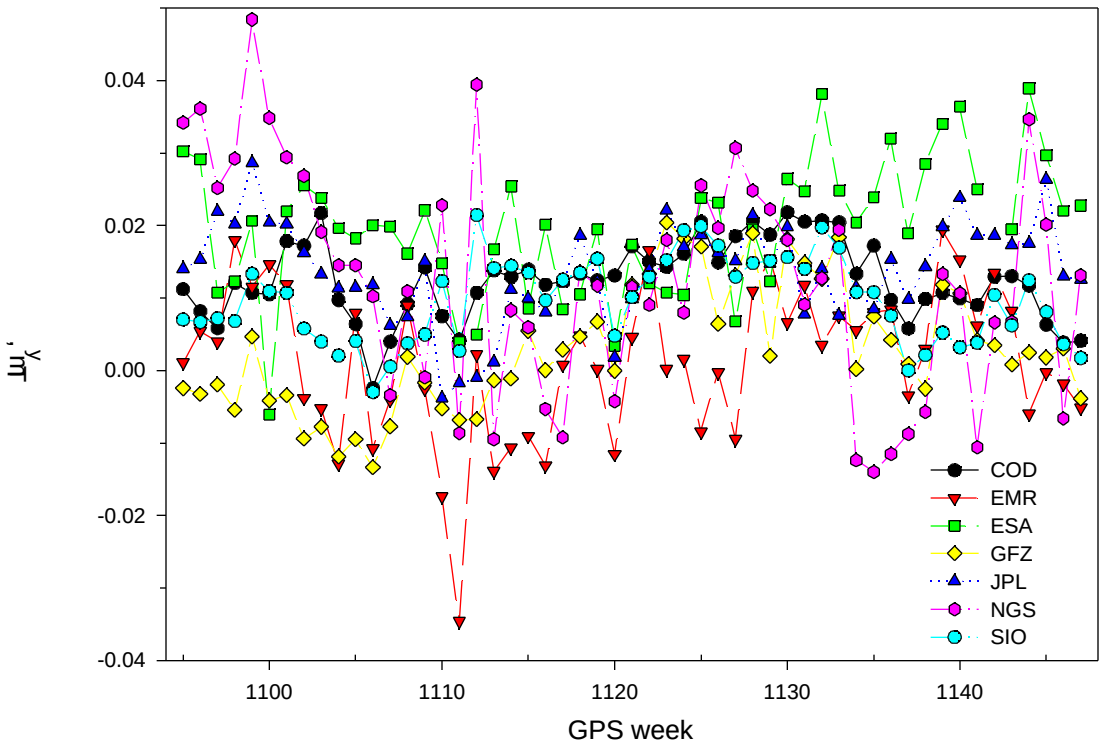

Figure 5. Time series of T_y transformation parameter for the ACs to IGS

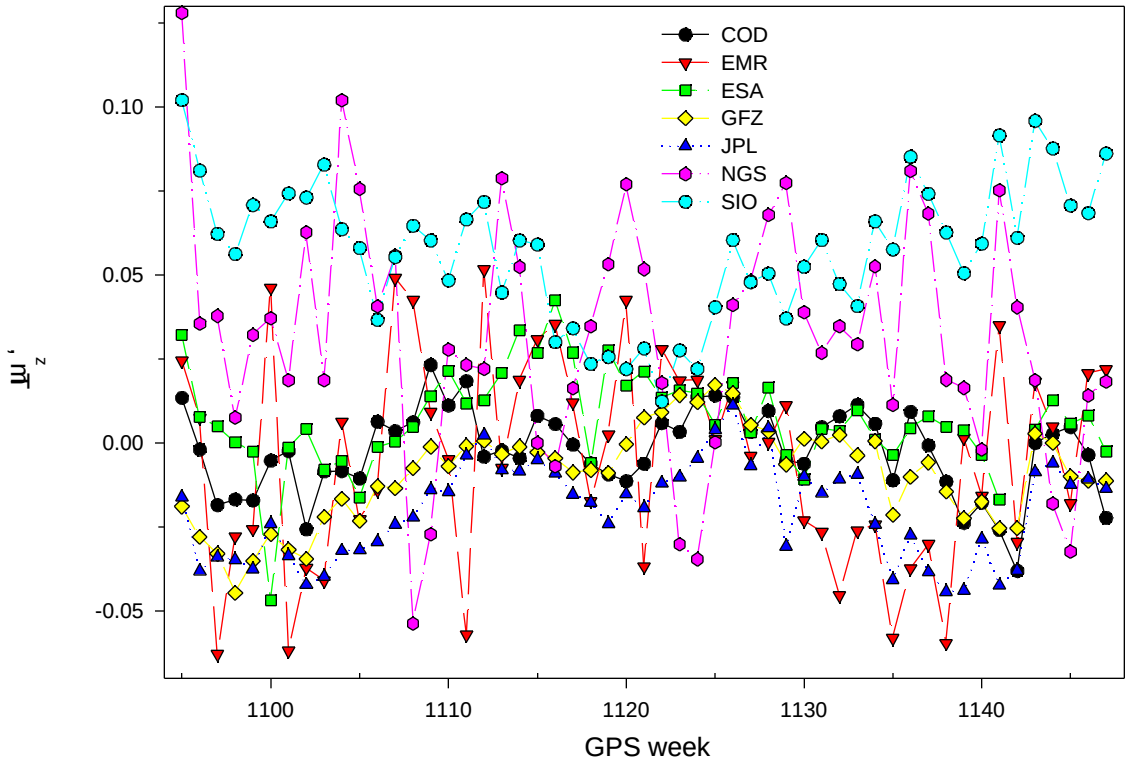

Figure 6. Time series of T_z transformation parameter for the ACs to IGS

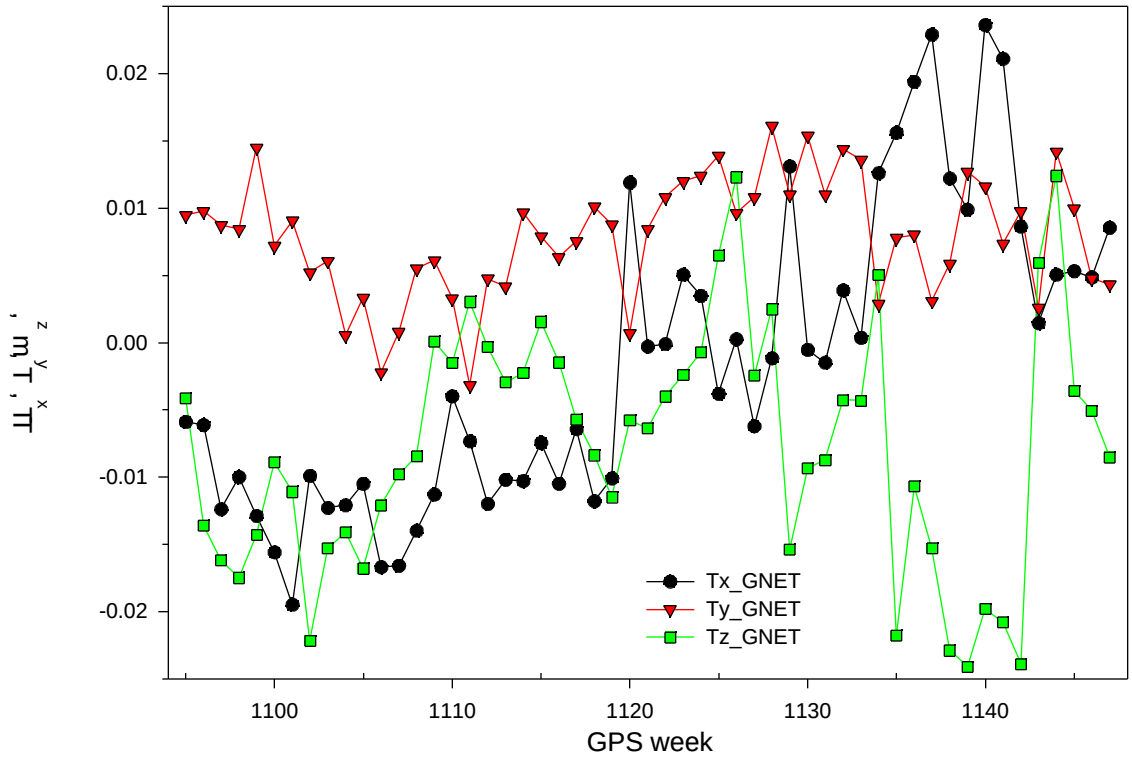

Figure 7. Time series of T_x , T_y , T_z transformation parameters for the NCL GNET to IGS

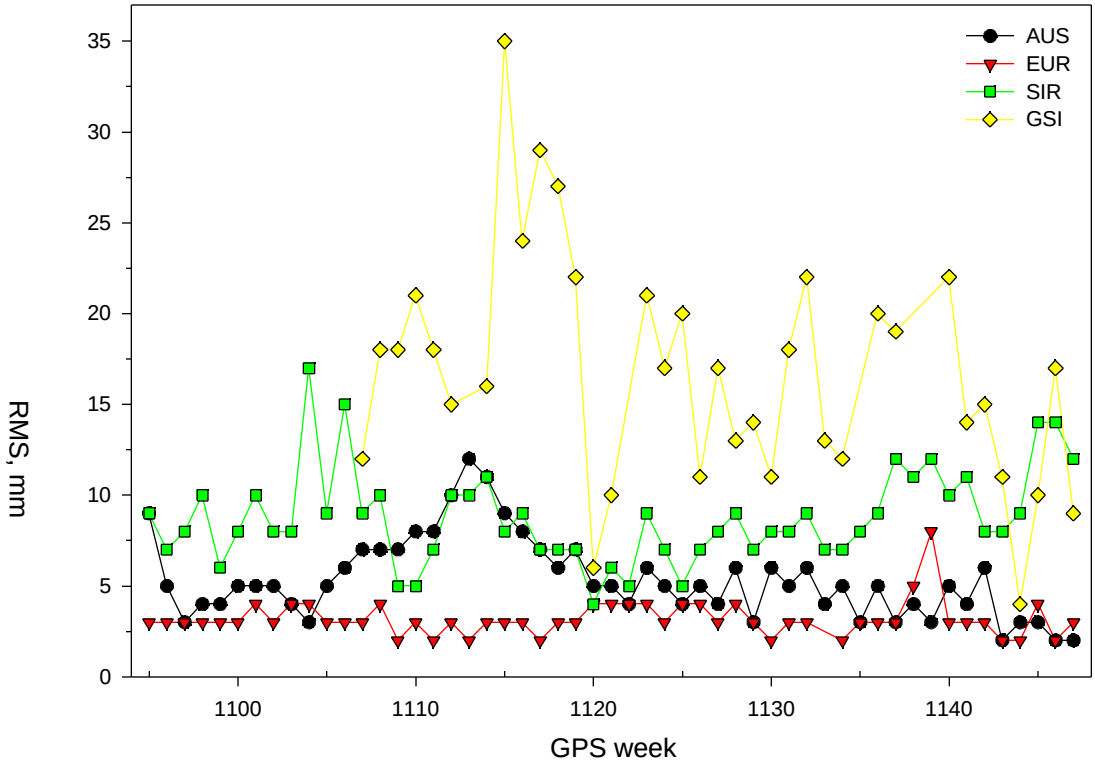

Figure 8. RMS of residuals for RNAAC R-network transformation to loose NCL G-network

Other Activity

NCL GNAAC P-sinex solutions over a five-year interval have been used to detect seasonal variations of station coordinates and geocentre position (Blewitt *et al.*, 2001a, 2001b).

An online SINEX-checking facility to assist ACs in submitting SINEX files has been created at http://ucscgi2.ncl.ac.uk/~nkn3 .

Summary and Outlook

The GNAAC at University of Newcastle continued to submit weekly G-network and P-network SINEX files to IGS. The most problems encountered were because of inversion problems with covariance matrix and late submission of solutions from ACs and RNAACs.

In the 2002, the Newcastle GNAAC continues to submit combined solutions to IGS. Starting week 1159 we produce combined solutions for Earth Rotation Parameters (X_p, Y_p, LOD). The TANYA software continues the base for further software development.

References

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